CLAIMS

1. A pack-bonded, multiphase composite material for use in a cell of a battery, comprising:

at least two layers of a matrix material pack-bonded with at least one layer of a reinforcement material, wherein said reinforcement material is oriented in a pack-bonded direction and wherein said matrix material and said reinforcement material are chemically dissimilar.

2. The pack-bonded as in claim 1, wherein said reinforcement material is uniformly dispersed upon a surface of one of said matrix materials.

3. The pack-bonded material as in claim 1, wherein said matrix material is selected from the group consisting of lead and lead alloys.

4. The pack-bonded material as in claim 1, wherein said reinforcement material is a plurality of non-conductive, large length-to-diameter ratio, low-density fibers.

5. The pack-bonded material as in claim 4, wherein said fibers are selected from the group consisting of nylon fibers, glass fibers, polymeric aramid fibers, aluminum oxide fibers, graphite fibers, alumina-type glass fibers, metallized fibers, polymeric fibers, and combinations thereof.

6. The pack-bonded material as in claim 1, wherein said at least two layers of said matrix material is three layers and said at least one layer of said reinforcement material is two layers, such that a top layer, a bottom layer and a middle layer of said matrix material are provided.

7. The pack-bonded material as in claim 6, wherein said top layer and said bottom layer are a first matrix material of a first thickness and said middle layer is a second matrix material of a second thickness.

8. The pack-bonded material as in claim 7, wherein said first matrix material provides predetermined surface properties to the pack-bonded multiphase composite material.

9. A method of producing a composite material for a cell of a battery, comprising:

forming a stack of at least two layers of a matrix material interleaved with at least one layer of a reinforcement material wherein said matrix material and said reinforcement material are chemically dissimilar;

providing said stack to a pack-bonding process; and

pack-bonding said stack such that said reinforcement material is uniformly dispersed within said matrix material in a pack-bonding direction.

10. The method according to claim 9, wherein said pack-bonding process comprises one or more cold-rolling processes.

11. The method according to claim 9, wherein said matrix material is selected from the group consisting of lead and lead alloys and said reinforcement material is a plurality of non-conductive, large length-to-diameter ratio, low-density fibers.

12. The method according to claim 11, wherein said fibers are selected from the group consisting of nylon fibers, glass fibers, polymeric aramid fibers, aluminum oxide fibers, graphite fibers, alumina-type glass fibers, metallized fibers, polymeric fibers, and combinations thereof.

13. The method according to claim 9, wherein said stack forming step comprises:

providing three layers of said matrix material interleaved with two layers of said reinforcement material such that a top layer, a bottom layer and a middle layer of said matrix material are defined.

14. The method according to claim 13, wherein said top layer and said bottom layer are a first matrix material of a first thickness, and said middle layer is a second matrix material of a second thickness.

15. The method according to claim 14, wherein said first matrix material provides predetermined surface properties to the composite material.

16. The method according to claim 9, wherein said stack forming step comprises:

interleaving a top continuous film of said matrix material, a first continuous film of said reinforcement material, a middle continuous film of said matrix material, a second continuous film of said reinforcement material, and a bottom continuous film of said matrix material.

17. A method of forming an expanded metal battery plate, comprising:

interleaving at least two layers of a matrix material with at least one layer of a reinforcement material, wherein said matrix material and said reinforcement material are chemically dissimilar;

pack-bonding said at least two layers of said matrix material and said at least one layer of said reinforcement material into a composite material, wherein said composite material includes said reinforcement material uniformly dispersed within said matrix material in a pack-bonding direction; and

expanding and cutting said composite material to form the expanded metal battery plate.

18. The method according to claim 17, wherein said interleaving step comprises:

providing a top continuous film of said matrix material, a first continuous film of said reinforcement material, a middle continuous film of said matrix material, a second continuous film of said reinforcement material, and a bottom continuous film of said matrix material.

19. The method according to claim 18, wherein said first matrix material provides predetermined surface properties to the composite material.

20. The method according to claim 17, wherein said pack-bonding step comprises one or more cold rolling processes.